CLAIMS

WE CLAIM:

1. A system for determining a structural condition of an item, comprising:

a piezoelectric sensor that is adapted to be supported on the item;

a resistive element coupled in series with the piezoelectric sensor;

a signal conditioner that conditions a signal including an indication of a voltage drop across the sensor;

a transmitter that transmits the processed signal; and

a remotely located interface that receives the transmitted signal and provides an output indicative of an impedance of the processed signal and the structural condition of the item.

2. The system of claim 1, wherein the resistive element has no inductance.

3. The system of claim 1, wherein the signal conditioner includes a bandpass filter.

4. The system of claim 3, wherein the bandpass filter removes signal components below approximately 50 KHz and above approximately 200 KHz.

5. The system of claim 1, wherein the transmitter and the remotely located interface communicate using wireless signal transmission.

6. The system of claim 5, wherein the transmitter and the remotely located interface utilize radio frequency signal communication.

7. The system of claim 1, wherein the interface includes a portion that determines a mechanical impedance value of the processed signal and determines an indication of the structural condition from the impedance value.

8. The system of claim 1, including a varying voltage generator that applies a voltage across the resistive element and the sensor.

9. The system of claim 8, wherein the voltage generator is a sine sweep generator.

10. The system of claim 1, including a differentiating portion that differentiates an impedance value of the transmitted signal over time and wherein the interface synchronizes data acquisition from the transmitted signal with at least one selected value of the voltage generator.

11. The system of claim 10, wherein the differentiating portion includes an RC circuit.

12. A method of determining a structural condition of an item, comprising the steps of:

(a) attaching a piezoelectric sensor to the item;

(b) coupling a resistive element in series with the sensor;

(c) transmitting a signal that includes an indication of a voltage drop across the sensor to a processor located remotely from the sensor; and

(d) determining a structural condition of the item from the transmitted signal.

13. The method of claim 12, including embedding the sensor within a portion of the item, using the sensor as an actuator to induce vibrations in the item and simultaneously monitoring vibration in the item using the sensor.

14. The method of claim 12, wherein step (C) includes using wireless communication.

15. The method of claim 14, wherein step (C) includes using radio frequency communication.

16. The method of claim 12, wherein step (D) includes determining an impedance value of the transmitted signal using the indication of the voltage drop and using the impedance value to determine the structural condition.

17. The method of claim 12, including applying a voltage with a varying frequency across the resistive element and the sensor and differentiating the impedance value of the transmitted signal over time to thereby determine synchronization indicators and using the indicators to synchronize data acquisition from the transmitted signal with the varying voltage.

18. The method of claim 17, including using a sine sweep generator.

19. The method of claim 12, wherein step (C) includes conditioning the signal to remove selected frequency components prior to transmitting the signal.

20. The method of claim 12, wherein the voltage drop of step (C) is frequency dependent.